Remarks by the Honorable Fred Gregory
NASA Deputy Administrator
"Turning Goals into Reality" Conference
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Thank you Del (Del Freeman, Director Langley Flight Research Center), I appreciate your gracious introduction. I am very happy to be here in historic Williamsburg.

Administrator O'Keefe very much wanted to be here today, but the press of business has kept him in Washington. He asked me to send his warm regards and best wishes for a most successful conference.

For my part, I am delighted to be with you today. This is such a beautiful place, with its rich gardens, colonial homes and constant reminders that the seeds of our democracy sprang forth from here 300 years ago.

We are also mindful that some ninety miles to the south, the seeds of aviation sprouted from a sandy beach on the shores of Kitty Hawk nearly 100 years ago. Today we gather in a most historical setting not only to talk about our past accomplishments in aeronautics and space, but to also dream about the future.

Indeed, NASA's job is to pioneer the future on a daily basis as we pursue our mission goals to understand and protect the home planet, explore the Universe and search for life, and inspire the next generation of explorers.

And while NASA is best known for space research and exploration accomplishments, we hold dear our aviation roots and take seriously our congressional charter to continue pushing the envelope with cutting-edge aeronautics research.

That's why our NASA scientists and engineers are working hard to develop technologies that will transform our aviation system to meet the needs of the future.

In the years ahead, we expect to achieve tangible progress in such areas as lightweight flexible wing designs and intelligent flight control systems, and in making our aviation system more safe and secure.

This work will build upon the amazing progress we have witnessed during the first century of flight. Who would have dreamed just a mere 100 years ago that by flying though the air humankind could so dramatically change our destiny.

Aviation has provided this country with such tremendous benefits. Some are quite obvious. One hundred years ago, for example, my trip from Washington to Williamsburg would have likely taken at least one-day by rail or boat. By horse drawn carriage, maybe two days. Today, by air, it takes a mere 30 minutes.

The American airline industry is the largest in the world with over 600 million passengers flying annually. Additionally, the General Aviation sector flies over 150 million persons each year.

Aviation also produces tremendous economic prosperity and ensures our national security.

Today, airports are economic powerhouses in our global economy, generating nearly 11 million jobs and $1 trillion in economic activity per year. Air cargo alone is a $75 billion per year enterprise worldwide. U.S. freight carriers handle over 1/3 of the world cargo market. And aviation continues to grow.

By 2020, it is estimated that commercial air travel could exceed the volume of all auto travel in 1990. By 2018, the freight fleet is expected to grow by more than 3,000 aircraft, contributing to the sale of over 15,000 commercial transports over this period, exceeding $1.3 trillion of value.

While economics is so important, one must not forget aviation's critical role in providing our national security. Military aviation forms the backbone of the U.S. Security strategy. America has benefited from having air superiority in every conflict since the Second World War, including the Vietnam conflict that I participated in as an Air Force pilot.

Our prowess in military aviation has shortened conflicts and saved lives on countless battlefields, as the magnificent performance of our combined Air Force, Navy and Marine Corps aviators demonstrated in the recent Iraqi Freedom campaign. More importantly, American military airpower prevents conflicts from beginning in the first place.

However, our dominance in civilian and military aviation did not happen by chance or luck. Breakthroughs in aeronautical technologies brought us to where we are today. These breakthroughs technologies required hard work, money, patience and innovation.

Wilbur Wright, who with his brother Orville was no stranger to setbacks before they successfully flew at Kitty Hawk, said after their momentous achievement a century ago, "We found that men of the very highest standing in the profession of science and invention had attempted to solve the problem of flight…But one by one, they had been compelled to confess themselves beaten and had discontinued their efforts. In study their failures, we found many points of interest to us."

Because of that interest, and willingness to learn by a process of trial and error, the rest is history, and the spirit of exploration, discovery and invention that finally sent us into the air on the shore of Kitty Hawk now reaches throughout our skies, into space and throughout the solar system.

I mentioned earlier that NASA's aviation heritage goes a long way back. In 1915, when the European aviation powers threatened to dominate this new field, Congress established our predecessor organization, the National Advisory Committee for Aeronautics, or NACA.

The NACA contributed greatly to our aerospace history by building our national wind tunnel and testing facilities and by developing a talented cadre of aeronautical engineers and researchers. When World War I ended, the NACA turned its attention to the solutions of a broad range of problems in flight technology, and what followed was a three-decade long blossoming of the aviation field.

As the 1950's dawned, the country entered the jet age and would soon move into the space age. In 1958, President Eisenhower merged the NACA with the Army and Navy rocket programs to form NASA. While the work in aeronautical research continued, many scientist and engineers turned their focus to space race with the Soviet Union. Many of the technologies and theories developed by the NACA were applied to our efforts in space.

Our aviation prowess help lead to John Glenn's successful orbits around the Earth and eventually to Neil Armstrong and Buzz Aldrin's walk on the Moon.

Fittingly, Neil and Buzz brought with them to Tranquility Base a precious relic from the Wright Brothers' first powered flight in 1903: a piece of the Wright Flyer's fabric and propeller. Yes, we have come a long way since Kitty Hawk, and this adventure without end is just beginning.

While we have much to be proud, our legacy is not secure. The Cold War is over, and we cannot rest on our laurels in this highly competitive and increasingly dangerous world. Today, while America remains pre-eminent in aviation and space, we face a host of new challenges. The Commission on the Future of the United States Aerospace Industry outlined many of them last year.

They include limits in aviation system capacity, environmental issues related to noise and emissions, the need to ensure the safety and security of our air transportation system—a lesson we learned dearly on September 11th 2001—as well as the need for continued leadership in space access and to arrest declining spending on aerospace R&D, and combat the erosion of our aerospace workforce. These are tall orders indeed.

The Aerospace Commission made nine recommendations to ensure the health of the US aerospace industry, five of which focus on research and technology, which I am proud to say our Aerospace Technology Enterprise is making today.

Our Aerospace Technology Enterprise pioneers and validates high-payoff technologies in order to improve the quality of life, enable exploration and discovery and extend the benefits of our innovation throughout society.

I like to think of this Enterprise as the "Technology Provider" for the rest of NASA and the nation as a whole.

Please allow me to give everyone here a few examples of the high-payoff technologies that have been developed in the recent past and examples of ones nearing completion.

We have many customers. Industry, other government agencies, even our own space science and earth observation programs use the research and technologies developed by this Enterprise.

In space, our Mission and Science Measurement Technologies efforts develop crosscutting technology for a variety of aviation and space applications, such as communications, power and propulsion systems, nanotechnology, and biotechnology. Many of these technologies enable our space science exploration missions and our earth science observations.

During the late 1990's, NASA demonstrated a new, revolutionary ion propulsion system on the Deep Space 1 mission. Just five kilograms of xenon fuel provided the

steady push for the six weeks of thrusting in which the spacecraft's speed was increased by nearly 300 meters per second or 650 miles per hour. The same amount of standard rocket propellant would have changed the speed by a mere 22 meters per second.

This was just one of the dozen advanced technologies on board Deep Space One that will pave the way for future spacecraft being smaller, less expensive, more reliable and more independent of human control.

Today, our scientists are working on the Mars Climate Sounder instrument, scheduled for the 2005 Mars Reconnaissance Orbiter, which will sample the planet's atmosphere using an infrared detector. This detector consists of nine un-cooled thermopile linear arrays. The instrument will sample atmosphere at 20 altitudes simultaneously – measuring pressure, temperature, gas composition and dust. These instruments were engineered to be one-eighth of their original weight – and now perform using a quarter of the initial power specifications.

NASA also provides the Department of Defense with its latest advanced aeronautical research and technologies. For most of the 1990's, for example, NASA researchers teamed with the Air Force on the F-18 High Alpha Research Vehicle or HARV research aircraft to explore aircraft maneuverability and controllability at high angles of attack. This program examined thrust-vectoring technology as well. Many of the results of these flight experiments are incorporated in the new F-22 and Joint Strike Fighter, which will form the backbone of our nation's air power for next twenty years.

The commercial aviation sector is also an important customer for our aerospace research. For the past fifty years, U.S. commercial aircraft manufacturers have benefited from numerous NASA/NACA technology breakthroughs ranging from the Richard Whitcomb's transonic "area rule" to winglets to composite materials used in wings of commercial airliners.

There are many other technology advancement stories to talk about. After a series of airliner accidents in the late 1980's caused by wind shear, NASA and our long time partners with the Federal Aviation Administration set out to find a solution to the problem. NASA developed airborne weather radar algorithms to detect wind shear and alert the crew. We also developed crew procedures for use in training pilots on how to deal with wind shear encounters. These procedures and radars detector systems became

standard on most airliners by the late 1990's. As a result of NASA technology, wind shear accidents are now hopefully a thing of the past.

NASA is similarly mindful of how our aeronautics technology can help improve the environment. For instance, jet engines are a major contributor of nitrogen oxide pollution that fouls our urban air. To address this problem, NASA has developed and passed on to industry advanced technologies for jet engine combustors that reduce nitrogen oxide emissions by 50% as compared to 1996 international regulatory standards.

Working with our partners at FAA, we've also developed the Traffic Management Advisor, a software tool that maximizes airport capacity by assisting controllers in safely balancing arrival demand with airport capacity thus minimizing delays. The Traffic Management Advisor is currently operational in eight FAA Air Route Traffic Control Centers. The airports using this software are seeing a 3 to 5 percent increase in capacity. This means fewer delays and more air passengers making their connecting flights.

Another area where we are doing exciting work is the Small Aircraft Transportation System or SATS. SATS research has the potential to increase use of small community airports without requiring changes to control towers, radar installations, or increased land use for added runway protection zones. Simply put, added system capacity without new and expensive infrastructure additions. This project is the product of the National Consortium for Aviation Mobility, a consortium that is engaging a broad range of industry, university, state and local aviation authority groups from across the nation with NASA and the FAA.

As you can see, our Aerospace Enterprise is doing some amazing things. While the "Turning Goals in Reality" conference is an annual event where we gather to celebrate our past and present accomplishments, I want to now shift for a few minutes to talk about the future. The future is really what NASA is all about. Where are we going from here? What great challenges do we need to address beginning today?

On the aviation side, we have a detailed plan for the future. It is the NASA Aeronautics Blueprint and will lead us toward a bold new era of aviation.

The blueprint calls for investment in new and exciting technologies, such as nanotechnology, miniaturization at atomic scale, and biotechnology and addresses the

major challenges facing aviation today: safety, security, capacity and environmental compatibility.

To help advance the goals of the blueprint we have responded to requests by our partners and industry and increased our investments in aircraft noise reduction, specifically our Quiet Aircraft Technology program to directly reduce the noise produced by jet engines by 10 decibels in comparison to the 1997 state of the art.

Of course, in the aftermath of September 11th, heightened, but efficient, security of the aviation system is a critical long-term requirement. Our FY 2004 Budget request includes our new program in Aviation Security. Next year we hope to invest $21 million for this new initiative. NASA research will focus on concepts and technologies that can protect aircraft and the airspace system from criminal and terrorist attacks while improving the efficiency of security. One area the Aviation Security program will focus is flight control technologies that would prevent an aircraft from being purposefully crashed.

We also hope to invest $27 million in FY 2004 for the new National Airspace System Transition initiative. The research within this program will focus on developing a more flexible and efficient operational approach to air traffic management in light of the projected growth in air travel during the coming decade and beyond.

Additionally, NASA, the Department of Transportation, the FAA, and the White House Office of Science and Technology Policy are working to establish a national aviation system transformation program. This will include a joint program office to set goals and align missions across government agencies to ensure the U.S. stays at the forefront of aviation and meets demands of the future. We hope to have the Joint Program Office operational by the end of the year.

As you can see things are taking off on the aviation side, but there is another side to this Enterprise…the space-side.

We are at a crossroads in the human space program. The Columbia tragedy was a big blow. Now we are focusing on preparing to safely return to flight with the Shuttles. We are also looking freshly at our near term objectives, which were presented in our Integrated Space Transportation Plan, a document that attempts to provide a systematic approach to our space access needs.

The plan is comprised of three elements—investments to assure the Shuttle's operational life for continued safe operations, the development of an Orbital Space Plane to ferry crews to and from the International Space Station and serve as a rescue system for the Space Station and the human spaceflight program, and investments in next-generation of launch vehicle technology in such areas as propulsion, structures and operations.

While we believe many of the elements of this plan are still valid we do wish to consider how the recommendations of the independent Columbia Accident Investigation Board might affect the plan, and make adjustments as necessary.

Incidentally, for the Orbital Space Plane, a program office has been established with management of the program reporting directly to Headquarters. Clear and concise Level 1 requirements for the OSP have been established, which identify the critical top-level specifications that the Space Plane must meet - without dictating a design solution.

The trade space is open for innovative design solutions from industry to best meet NASA's needs. There is no preconceived notion on the ultimate vehicle's design – whether it is a winged vehicle, a lifting body shape, or a capsule. The final design will be selected based on the ability to meet all of the Level 1 requirements. We are also conducting a series of studies to evaluate whether it is feasible to accelerate the Orbital Space Plane Program development schedule. These results should be available later this summer.

In addition to the Orbital Space Plane, we are moving out on a longer-term space access technology effort. The National Aerospace Initiative is a partnership between the Department of Defense and NASA designed to sustain our aerospace leadership thorough technology development and demonstrations in three critical areas….hypersonics, space access, and space technology.

This initiative will boldly push the space frontier further and faster with breakthrough aerospace technologies, revitalizing our aerospace industry, stimulating science and engineering in our classrooms, and enhancing our security, economy, and quality of life.

Indeed, in the years ahead we intend to build a true highway to space. Aided by the National Space Initiative and guided by NASA's new Strategic Plan, we envision an

expanding human and robotic presence throughout the solar system as we develop new capabilities and our knowledge base on a step-by-step basis.

As we follow this plan in the years ahead, we hope to be able to reach any number of destinations, do important science at those destinations, and also advance economic and technological progress back home.

Specifically, our planners have focused on missions that will use gravitationally balanced points in the Sun-Earth system, to enable explorers to reach out to the Moons, asteroids, Mars, the moons of Jupiter, and to allow for the construction and servicing of huge next generation space telescopes that will be capable of viewing Earthlike planets orbiting nearby stars.

Using these gravitationally balanced areas or libration points as demarcation points, just as the Louis and Clark expedition used St. Louis to set off on their voyage of discovery 200 years ago, we plan to go ever outward, with sophisticated robots like the Mars rovers Spirit and Opportunity enhancing what our human explorers set out to do.

Let me assure you of one other thing. This is not just a visionary dream. We have identified a number of critical tasks or building blocks that we will develop in the near term to ensure that several bold scientific goals are achievable in the future. Among the important developments you can expect to see in the near future are continued research onboard the International Space Station to address the long-term health issues of crews exposed to radiation in space; additional NASA cutting edge research to exploit the potential of nanotechnologies; the demonstration of an advanced satellite laser optics communications system; and the development of nuclear propulsion systems that will enable exploration missions that are inconceivable with current chemical propulsion.

Friends the future is what we are all about. NASA is at our best when we are at the forefront of change, creating positive, dynamic technological solutions for society's most vexing problems and challenging ourselves to conduct cutting-edge air and space research and exploration missions. By maintaining our focus on how we can use technological progress to open up new avenues of scientific exploration and discovery, we will have handled our responsibilities well, and we will continue to make exploration

history. Again, I appreciate the opportunity to be with you today and I thank you for your warm welcome.